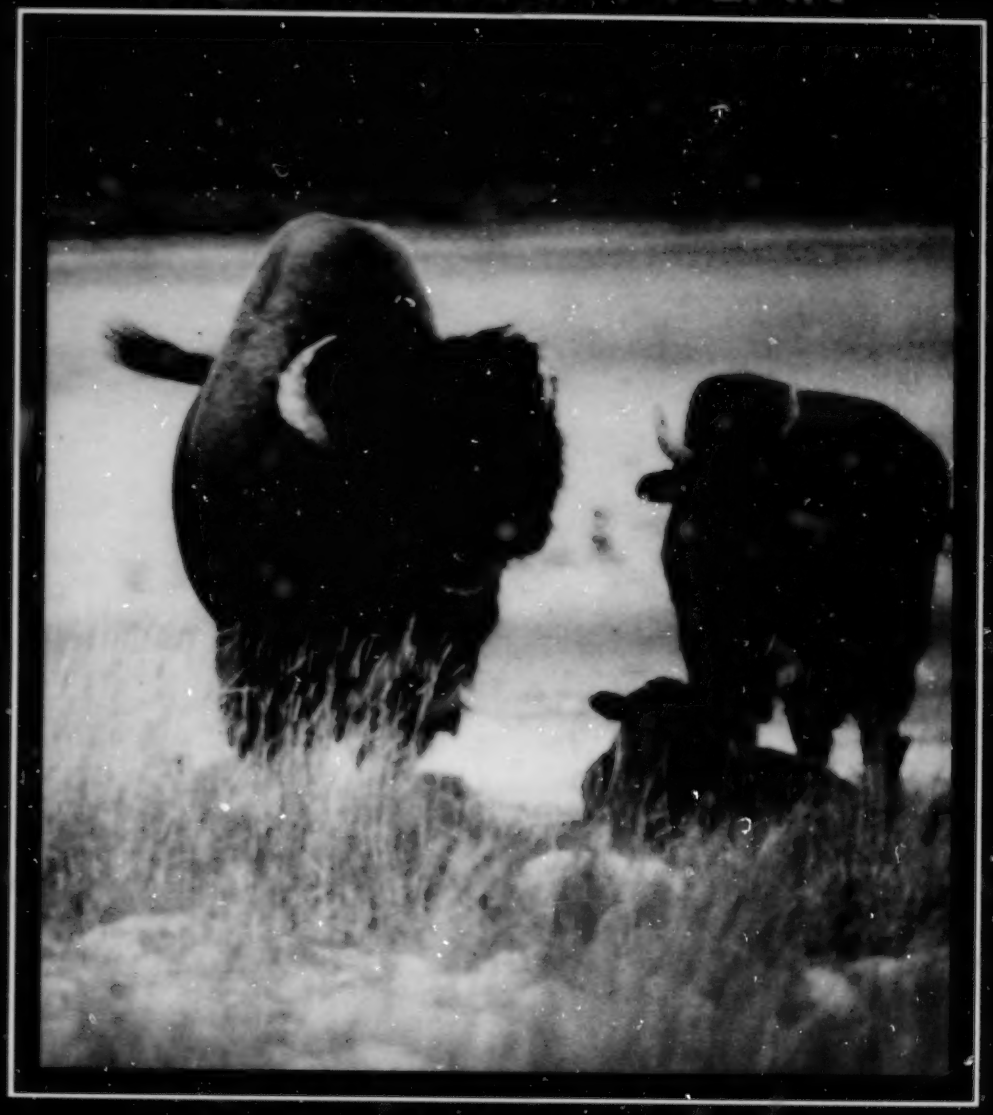
Department of Renewable Resources

MACKENZIE WOOD BISON MANAGEMENT PLAN



Government of the Northwest Territories

DRAFT

Ten Year Wood Bison Management Plan

for the

Mackenzie Bison Sanctuary Herd Northwest Territories

October 1983

Northwest Territories Renewable Resources
The Honourable Richard Nerysoo, Minister

DRAFT

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INTRODUCTION

Taxonomy and Description

The bison *(Bison bison spp.)* is a member of the family Bovidae, to which domestic cattle, sheep and goats belong. Bison are large, cloven-hoofed mammals, characterized by massive humped shoulders, a low slung head and relatively slim hind quarters.

The genus *Bison* is represented in North America by the plains bison *(B. b. bison)* and the more northerly subspecies, the wood bison *(B. b. athabascae)*. In general, the wood bison is slightly larger and darker than the plains bison, with the former having larger horn cores, denser fur and a less distinct "robe" or cape on the shoulders, hump and neck (Fig. 1). The skirt or "chaps" behind the front legs which is prominent on the plains bison is absent in the wood bison. Geist and Karsten (1977) have documented in greater detail the morphological and physiological differences between wood and plains bison.

K. Poole

Background

Wood bison were native to the Northwest Territories west of Great Slave Lake prior to the late 1800's (Raup 1933). Records of bison as far north as Lac la Martre and Yellowknife and as far west as Fort Simpson exist (Soper 1941). By 1900, as a result of increased hunting pressures and some severe winters, there were thought to be no bison remaining north of the Mackenzie River (Raup 1933).

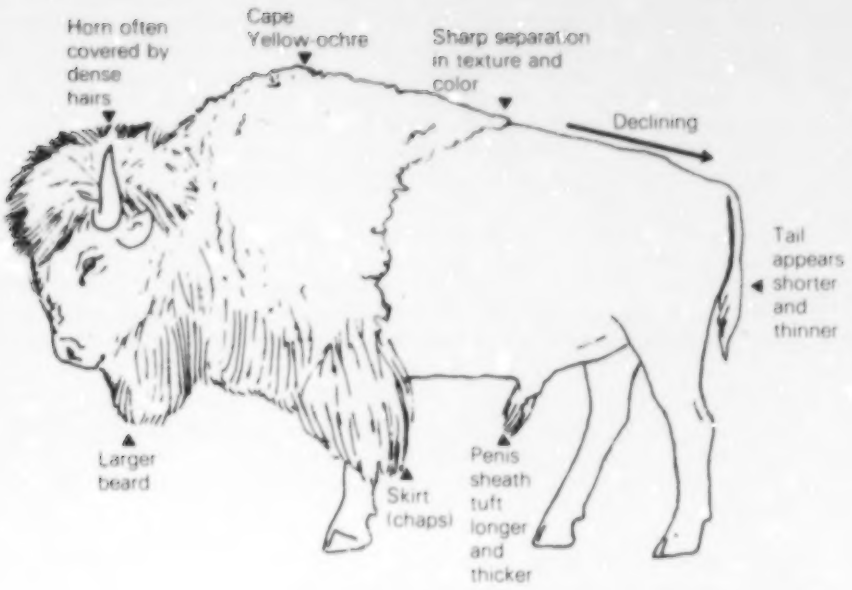
In the early 1900's, with federal protection, wood bison populations began to increase in Wood Buffalo National Park, with numbers reaching 2,000 animals by 1922 (Novakowski 1979). In the late 1920's the federal government introduced over 6,000 plains bison into the park and hybridization of the two subspecies occurred. As a consequence, wood bison were believed to be extinct as a subspecies by 1940 (Banfield and Novakowski 1960).

Speculation on the existence of small herds of wood bison in the northwestern part of Wood Buffalo National Park persisted. These rumours led Dr. N. Novakowski of the Canadian Wildlife Service to the discovery in 1957 of approximately 200 suspected wood bison along the Nyarling River. To prevent these bison from hybridizing with the introduced bison of the park herds, and to prevent loss to anthrax, portions of the herd were captured and transported to an area northeast of Fort Providence, Northwest Territories, and to Elk Island National Park in Alberta in 1963 and 1965, respectively. The region north and east of Fort Providence was designated the Mackenzie Bison Sanctuary to facilitate the introduction of the bison.

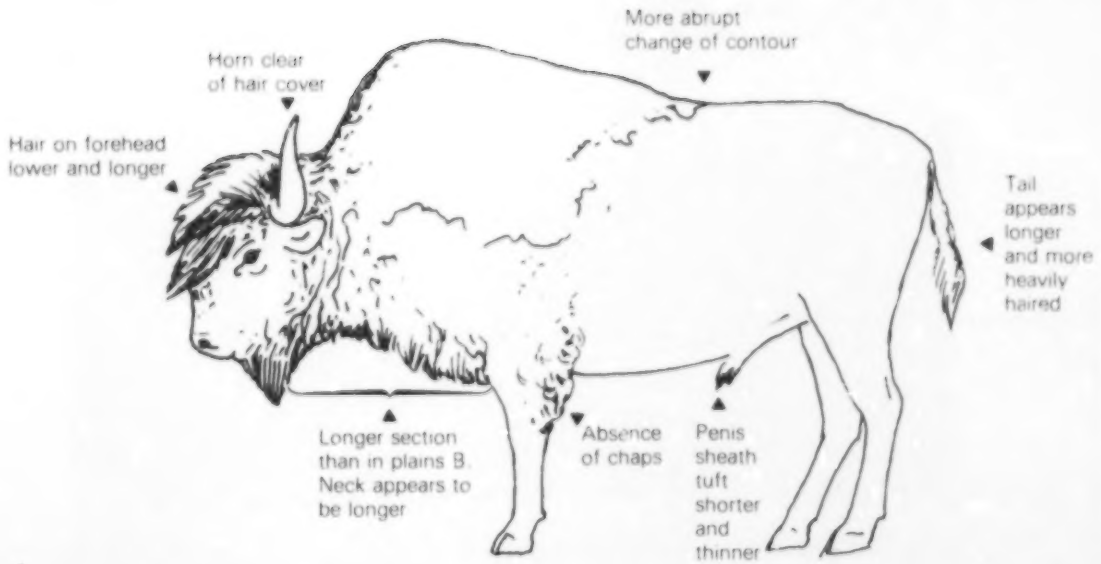
Investigations of skins and skulls of animals collected from the Nyarling River herd (Banfield and Novakowski 1960) and the Mackenzie Bison Sanctuary herd (Geist and Karsten 1977) have led to the conclusion that these animals are pure wood bison.

Wood bison are classed as an endangered species by the Convention on International Trade in Endangered Species (CITES), the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and the *Northwest Territories Act* (Reynolds 1980). This subspecies is also listed in the Red Data Book by the International Union for the Conservation of Nature (IUCN) and as such is recognized world-wide as an endangered species (Novakowski 1978). Wood bison in the Northwest Territories are protected from any form of hunting by the *Northwest Territories Act*. This act also provides for control of quotas once hunting is initiated. Bison in the Sanctuary are thus protected by virtue of their status as wildlife in danger of becoming extinct, rather than because of the area that they occupy.

In order to protect the Sanctuary from conflicting types of land use, the area should have been set apart and appropriated for use as a game sanctuary under the *Territorial Lands Act*. The Thelon Game Sanctuary is an example of an area properly constituted to reserve the land from noncompatible types of development.



Plains Bison Bull


More abrupt change of contour
Horn clear of hair cover
Hair on forehead lower and longer
Tail appears longer and more heavily haired
Longer section than in plains B. Neck appears to be longer
Absence of chaps
Penis sheath tuft shorter and thinner

Wood Bison Bull

Figure 1. Basic difference between a wood bison bull and a plains bison bull (Reynolds et al. 1982)

Location

The Sanctuary wood bison herd inhabits portions of the Mackenzie Bison Sanctuary, which presently covers over 6,250 km² of rolling terrain west of Great Slave Lake (Fig. 2). An amendment of the Game Ordinance, assented to on 20 November 1963, established the Mackenzie Bison Sanctuary. In its original configuration the Sanctuary was more than double its present size but subsequent boundary changes deleted the more westerly and northerly portions. This reduction in size did not diminish the level of protection to the bison because lands within the Sanctuary were not reserved from any form of land development.

Spruce *(Picea* spp*)* and jackpine *(Pinus banksiana),* intermixed with balsam poplar *(Populus balsamifera),* are found throughout the region (Rowe 1972). Large, shallow lakes and bogs, surrounded by sedge meadows and willow-sedge parklands, are numerous (Calef 1981). Plant associations, plant succession, geomorphology and associated wildlife are described in more detail by Jacobson (1976).

Biology

The rut in the Sanctuary is believed to occur between July and September, with peak activity in August (Calef 1976). Single calves are born in May to mid-June after a gestation period of 9 to 9 1/2 months (Novakowski 1978). Twinning is extremely rare.

Bison show a great range in the age at which cows first conceive (Reynolds et al. 1982). In northern studies, upwards of 80 percent of three year old, and 40 to 60 percent of two year old females have been recorded as being pregnant. Studies completed in Wood Buffalo National Park indicate that 5 percent of yearling cows were breeding (Reynolds et al. 1982).

Bison are primarily grazers; sedge *(Carex* spp.*)* and reedgrass *(Calamagrostis* spp.*)* are the two major components of their diet on the Slave River Lowlands (Reynolds et al. 1978). Forbs and browse species are apparently of minor importance. Similar vegetation preferences are believed to occur with the Sanctuary bison.

T. Chowns

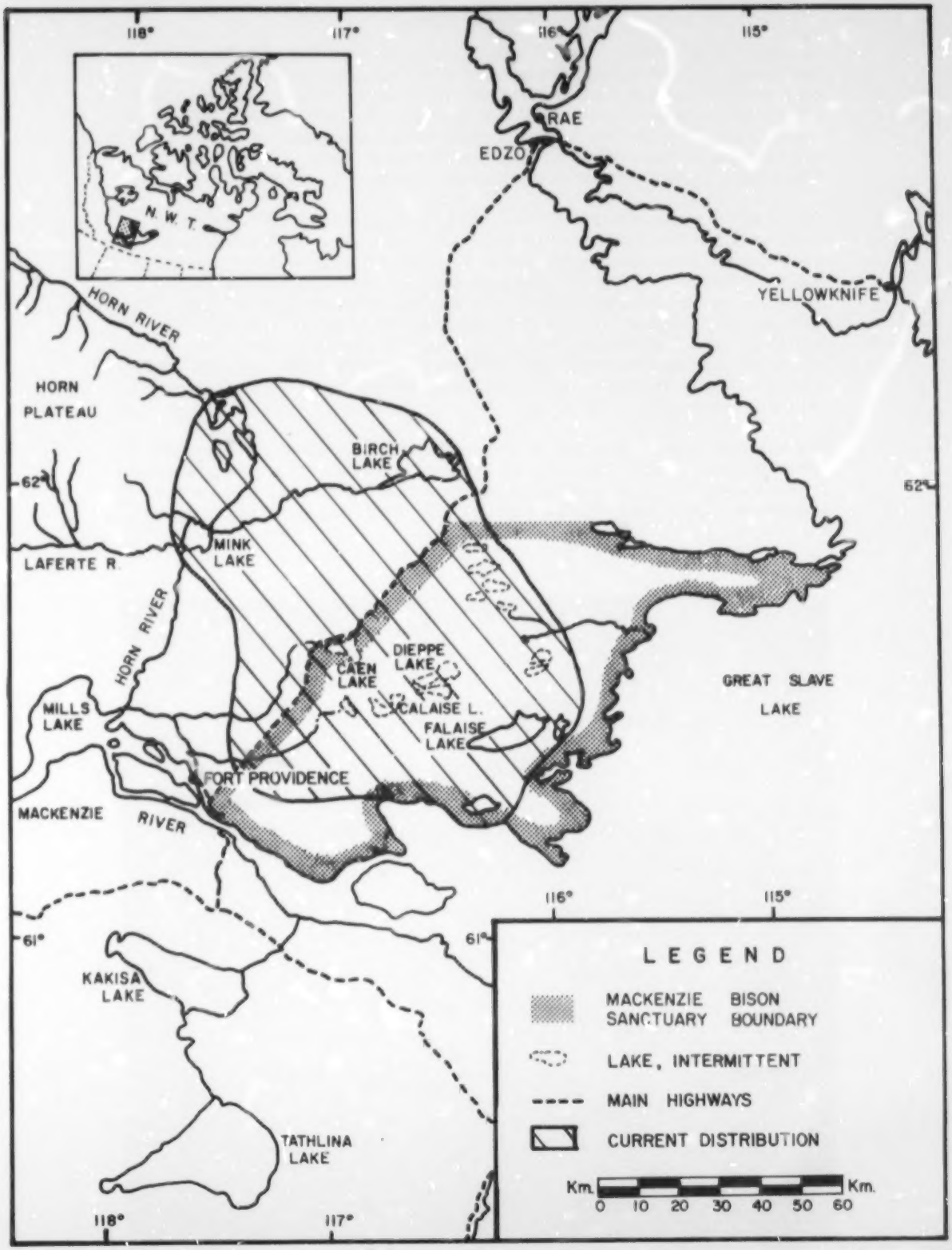


Figure 2. Location of the Mackenzie Bison Sanctuary, and distribution of the Sanctuary wood bison herd, N.W.T.

Current Status

In August 1963, 18 bison (four adult males, ten adult females, and four calves – two females and two males) were released in an area approximately 15 km northeast of Fort Providence (Novakowski 1963). Until the late 1970's population counts of the herd indicated an exponential annual increase of approximately 24 percent in the population (Fig. 3). This increase appears to have decreased in the past few years to approximately 20 percent annually. The latest survey of the Sanctuary, in March 1983, showed a minimum count of approximately 1,000 bison.

The terrain characteristics of the Sanctuary and corresponding bison distribution patterns reduce the effectiveness of conventional transect or block survey techniques. The bison are generally grouped and feed almost solely in the large exposed vegetated flats surrounding the lakes and bogs. The procedure followed in most surveys in the past has been to fly from lake to lake searching the open areas. The lakes are usually approached at an altitude of 200-300 m agl, with the observers able to see the entire meadow, noting the location of the herds. Each group is then circled and counted before they can reach the trees. Photography has been used to correct estimates, although small calves may be missed in photographs by being behind or under adults (Calef 1976).

The results of surveys completed to date have found 13-23 percent of the population comprised of calves (Appendix A). However, calves are not always visible during aerial surveys. The observed 20-24 percent annual increase in the population suggests that 20-25 percent of the herd has in the past been composed of young of the year.

T. Chowns

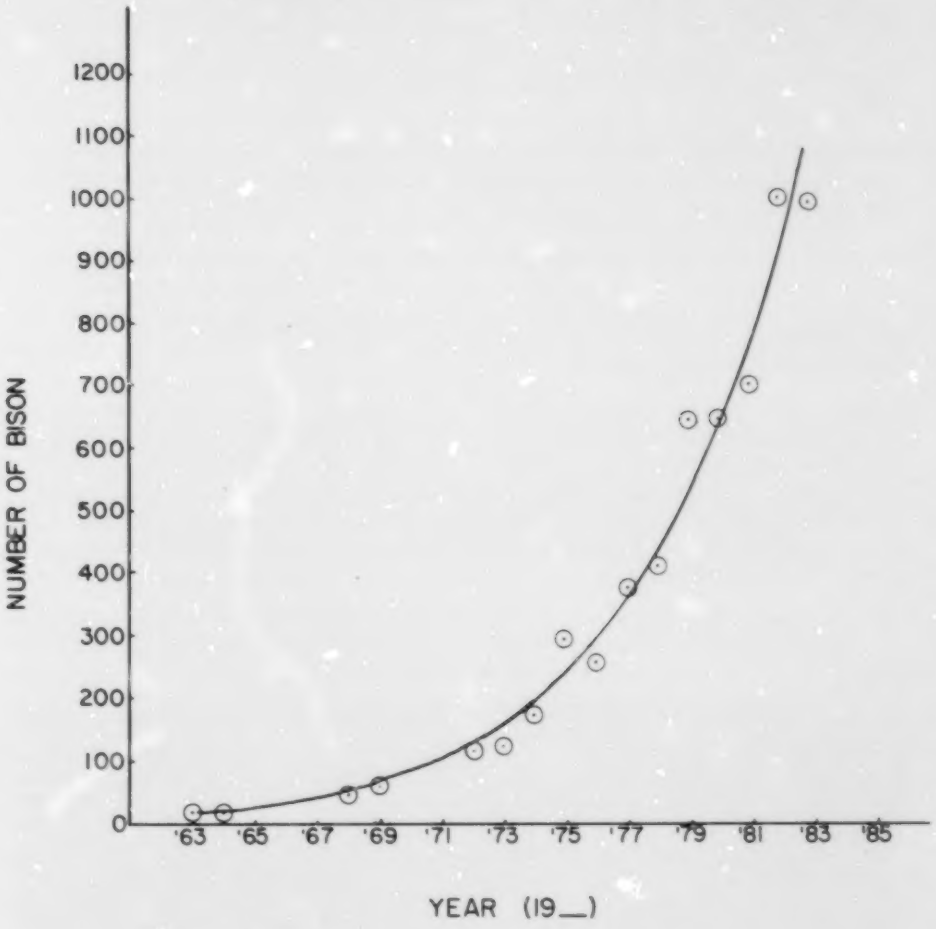


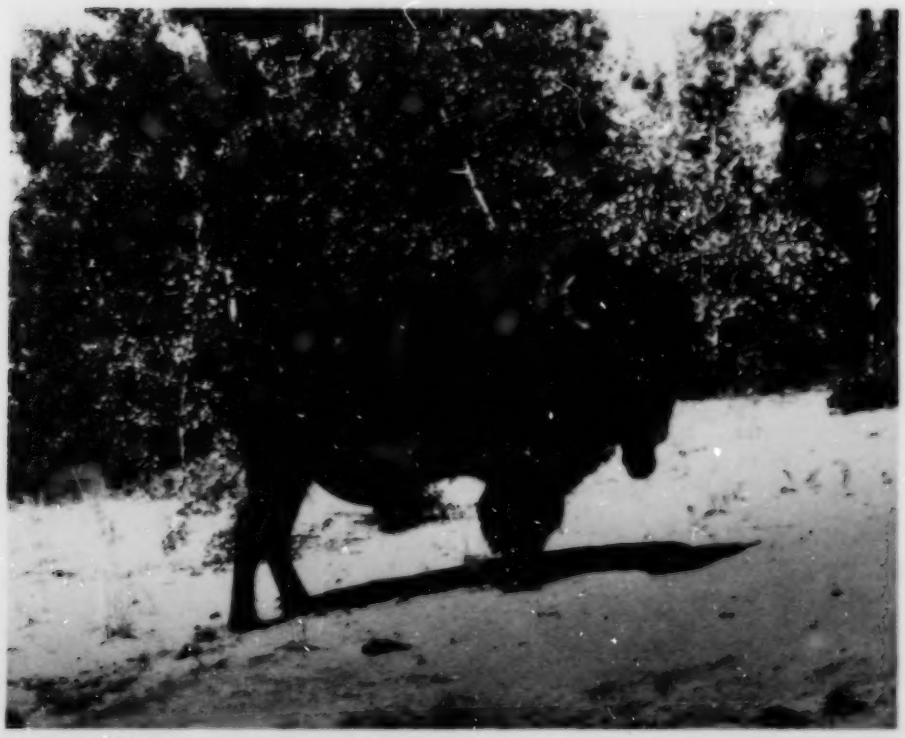
Figure 3. Wood bison population growth of the Mackenzie Bison Sanctuary herd, 1963-1983. (Appendix A).

Diseases such as anthrax, brucellosis and tuberculosis are thought to be absent. Predation by wolves is believed to be extremely low; two calf carcasses discovered in March 1983 are the only known examples of Sanctuary bison being killed by wolves (Chowns pers. comm.). Wolves, though found in moderate numbers in the Sanctuary, likely prey mainly upon moose and woodland caribou. Some authors believe that the wolves may not have yet learned to prey upon the bison (Calef 1981).

In the spring of 1982, 10 bison (five male, five female) were collected for biological study. Preliminary results from this collection suggest the bison are healthy and disease-free (Broughton pers. comm.).

Based on the increase of the herd and the observed numbers of calves, Calef (1981) constructed the most probable reproductive schedule for the bison in the Sanctuary. He theorizes that the observed calf crops would be produced if 90 percent of the females 3 years and older produced young each year. Survival of calves and yearlings must have been almost complete.

Until recently the expanding population in the Sanctuary was concentrated in the Falaise, Dieppe and Calais Lakes area (Fig. 2). The March 1983 survey located 79 bison in mixed groups southeast of Mink Lake (Graf pers. comm.). In addition to 41 animals seen on Caen Lake, 9 bison were found 8 km northwest of the lake outside of the Sanctuary. These sightings suggest that expansion of the bison range outside of the Sanctuary is directed towards the Horn Plateau area, with Caen Lake serving as the dispersal point.



T. Chowns

MANAGEMENT

Management Goals

Wood bison are slowly making a recovery from the brink of extinction. The Mackenzie Bison Sanctuary herd is now the largest free-ranging herd of *B. b. athabascae* in the world. The gene pool of the wood bison is beginning to be spread out and dispersed; however, except for the Sanctuary herd, a large majority of the animals are in captive situations in zoos and wildlife parks. The Sanctuary herd represents the only truly successful transplant of healthy wood bison into historically occupied range.

Accordingly, the goals governing management of the Mackenzie Bison Sanctuary wood bison herd for the next 10 years are as follows:

1) To maintain a viable, free-ranging herd of bison.

As the major wild herd of wood bison in the world, the Sanctuary bison must first and foremost be managed to maintain a healthy and productive population.

2) To utilize the Sanctuary herd for the purposes of increasing the range and population of wood bison in the Northwest Territories by providing animals for transplant, and to encourage the expansion and diversification of range utilized by the present bison population.

The ultimate goal of wood bison rehabilitation is to remove the subspecies from the CITES list of endangered wildlife (Reynolds 1982). This will be affected first by establishing three free-ranging, self-perpetuating populations of wood bison in areas of their historical range, and second by preserving the wood bison gene pool by dispersing the breeding population. Establishing widespread herds would ensure that wood bison would survive local catastrophies such as a disease outbreak or a large fire that might befall one herd.

3) To plan for the best utilization, by residents of the Northwest Territories, of animals surplus to the first two goals outlined.

Utilization of surplus animals from a healthy bison population would provide benefits to residents of the Northwest Territories. Large quantities of bison meat could supplement protein requirements for the southern Mackenzie Valley and Great Slave Lake area and could result in reduced hunting pressure on the Bathurst caribou herd. Non-meat portions of the animals could be utilized for a native crafts industry: hides for rugs and leather, horns and heads for mounts. In addition, sport hunters could eventually bring needed income into the region.

Management Objectives

The following objectives have been identified for the management of the Mackenzie Bison Sanctuary wood bison herd:

1) The first objective is to increase the size of the population centred within the Sanctuary. For the purposes of this plan two target population sizes are proposed; 2,000 and 5,000 bison. These numbers may be modified as range productivity and other habitat requirements are better understood. A number of management options will be considered in the realization of these targets.

Peden and Reynolds (1981) estimate that the carrying capacity of the Sanctuary is 14,000 head, based on standing crop and the productivity of forage. This figure is probably unrealistic from a management perspective and factors other than available forage will likely restrict the size of the Sanctuary herd. These factors may include over-utilization of core feeding areas, predation, or behavioural constraints. A population held below the estimated carrying capacity of the range may have higher productivity and less chance for localized overgrazing of core feeding areas.

A lower population density could also decrease the vulnerability of the herd to disease.

2) The second objective is to increase the number of wood bison herds in the Northwest Territories by transplanting bison to one or two appropriate sites.

3) The third objective is to produce the largest number of animals each year for the benefit of all people in the Northwest Territories.

Priority of harvest on other species has been allocated as follows:

a) General Hunting Licence (GHL) holders that traditionally hunt in the area,

b) resident hunters,

c) non-resident hunters, and

d) commercial utilization.

Native hunters will be given first access, but any harvest must be regulated and quotas imposed. Wastage of meat or hides must not be tolerated.

Resident sport hunters should be given an opportunity to take some of the surplus animals soon after harvesting is initiated. Adequate opportunity must also be given to non-consumptive use of the resource (i.e., to provide people with the chance to view and appreciate wood bison in their natural habitat).

4) The fourth objective is to develop a comprehensive land management strategy to ensure that bison habitat is managed and protected from competing land uses.

Management Prescriptions

The rapid increase of wood bison occupying the Mackenzie Bison Sanctuary and the interest in management has increased the need for sound information. The 10 year goals and objectives can be met with the following approach:

1) At a minimum, aerial surveys should be continued on an annual or biannual basis to monitor the increase and expansion of the Sanctuary herd. March surveys can be used to estimate population size and distribution. Calf production may be measured in late June or July surveys. The development of standardized inventory techniques and methods is required due to the increase in both the population size and the area used by the herd.

Additional information on population dynamics is required for more precise management. This information includes herd composition, minimum breeding ages for females, and mortality data. Surveys from the ground will be necessary to obtain accurate information on herd composition. Such a survey, emphasizing an accurate calf count after the end of calving in late June, should be carried out in 1984. Delineation of the calving season should be a high priority.

2) As noted earlier, the 10 bison taken during the controlled harvest in March 1982 were in good condition and disease-free (Broughton pers. comm.). Further assessment of condition and disease status should be undertaken when future harvests are initiated or when groups are rounded up for transplant projects. A veterinarian should be on hand to determine the occurrence of diseases and parasite loads through examination, as well as blood and tissue sample collection.

Diseases have had a large effect on the free-roaming populations of hybrid bison in the Slave River Lowlands and Wood Buffalo National Park. Anthrax, brucellosis and tuberculosis are the primary diseases involved. The Sanctuary bison are presently believed to be free of these diseases; however, studies should be initiated to confirm this and to assess the potential for the spread of any of these diseases from adjacent domestic stock to the herd.

Brucellosis and tuberculosis may be present in wolf, bear, caribou and other wildlife in the Sanctuary (Tessaro 1981). It must be determined if these diseases, with the wildlife acting as mechanical carriers or vectors, can be transmitted to the bison.

This study proposed by Dr. Stacy Tessaro of the Western College of Veterinary Medicine in Saskatoon should provide us with many answers regarding diseases in bison.

3) Wolf predation on bison is believed to be negligible at present. Mortality due to predation, as well as wolf population numbers should be closely monitored to see if wolf predation will become a significant mortality factor as the bison population increases and interaction between the species becomes more frequent.

4) Studies into range utilization should be initiated to determine seasonal habitat use by the population. As a minimum, critical habitats and core feeding areas within the Sanctuary must be identified and their protection from disturbance ensured.

As the population continues to increase above 1000 animals, studies should be initiated to assess forage production and utilization in areas of high bison concentration to monitor the possibility of overgrazing. Exclosures to protect sample areas from grazing may be of use in this regard. These studies should begin in the summer of 1984. Such assessment could supplement studies on forage production carried out by Peden and Reynolds (1981) in 1977, and serve as an indicator of localized overgrazing. The Canadian Wildlife Service has shown an interest in further range assessment studies in the Sanctuary; consultation with C.W.S. would be beneficial in this regard.

Further work to determine the extent of available habitat, grasslands and sedge meadow complexes, in the Sanctuary area should also be carried out. Analysis of summer and winter Landsat satellite imagery and aerial photography, verified through ground truthing studies, may be useful in delineating habitat types.

5) Habitat studies should determine new locations for introductions of wood bison. Once likely locations are determined, proposals for re-establishment of the bison should be developed. External funding may be available from such sources as the World Wildlife Fund and the Donner Foundation.

In August 1980, 28 wood bison were released in the Nahanni Butte area of the Liard Valley (Reynolds 1982). Calves have been produced, but losses and fragmentation of the group have resulted in fewer than 20 animals remaining in the Northwest Territories (Stephenson 1983).

Funding needed to carry out the aforementioned population surveys and habitat work will cost approximately $30,000 during the first year (Appendix B). This figure may be adjusted in subsequent years as management of the herd progresses.

6) Development of a computer model that will guide management should be a priority. A model has been developed that tracks the population increase over the past two decades. This model will continually be modified as new information on the bison population is uncovered, such as the effect of increasing densities on core habitat areas or changes in survival and/or fertility rates.

7) Discussions and dialogue with native groups and other possible user groups must occur on all aspects of bison management, including the review of this management plan. Some of the groups concerned are the Fort Providence Hunters' and Trappers' Association (HTA) and Dene Band, the Dogrib Tribal Council and the Northwest Territories Fish and Game Association. Cooperation and support is essential if the management of the herd is to have a chance to progress smoothly.

8) The computer model has been used to predict the rate of population increase at various fertility and mortality rates and determine the effects of different harvest strategies. At current rates of increase, target populations of 2,000 and 5,000 animals may be realized in 1986 and 1991, respectively (Fig. 4). The effects of various harvest and removal scenarios are shown graphically in Figure 4. Principles regarding harvesting apply to all options; for example, a slower rate of increase will result from early initiation of harvest, greater harvest size or more females being removed.

A controlled harvest of 20 to 40 males in the spring of 1984 is being considered. This harvest would have minimal impact on the productivity of the population, while providing meat for the communities and another opportunity to assess the condition and disease status of the herd (Fig. 4, scenario 2).

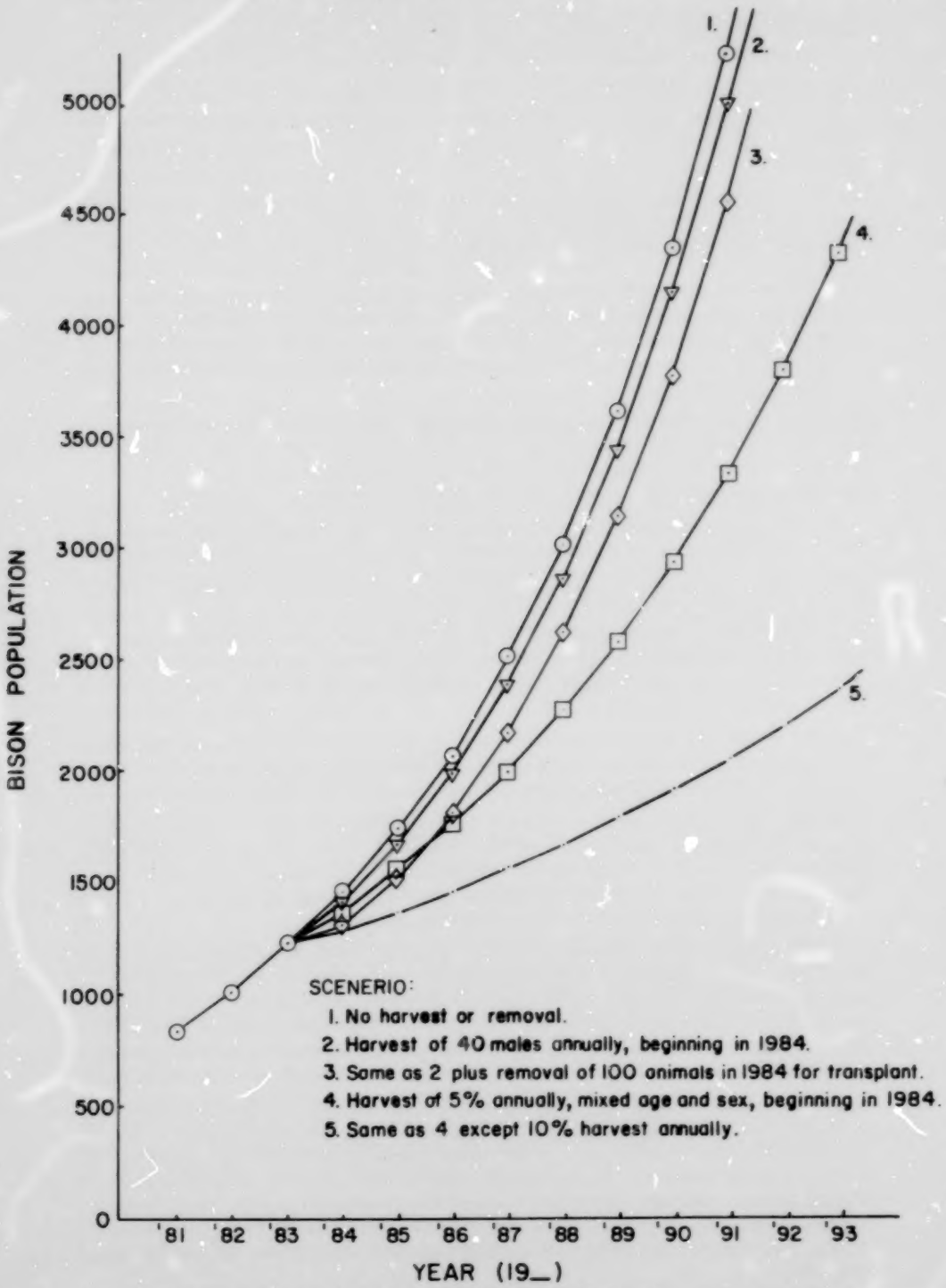


Figure 4. Population levels under various harvesting scenerios based on current rates of survival and productivity, Mackenzie Bison Sanctuary, N.W.T.

A proposal is presently being considered to transplant wood bison in the near future to the Slave River Lowlands south of Great Slave Lake. If animals are not available from Elk Island National Park in Alberta, then Sanctuary bison may be used. The removal of 100 animals of mixed age and sex classes is proposed for the transplant (scenario 3).

At a harvest level of 10%, conservative at current rates of survival and reproduction, 200 or 500 animals could be harvested annually from populations of 2,000 and 5,000 bison, respectively. Other factors could alter survival rates and natality affecting the overall productivity of the population. Continued evaluation of these factors when the target population is reached will be necessary.

9) Management of Sanctuary bison should allow continued high productivity and population increases while permitting some harvesting. When hunting is initiated, the harvest should be a controlled annual hunt. A controlled hunt will permit description of bison condition and diseases, and eliminate crippling losses.

The amount of red meat produced annually will be significant. A conservative harvest of 200 animals annually from the population of 2,000 bison would yield an estimated 55,000 kg of usable meat. An interesting comparison is that approximately 1250 caribou carcasses are needed to yield a similar quantity of meat, based on an average dressed weight of 45 kg of meat per caribou (Appendix C).

Even during the initial harvests a substantial amount of meat will be produced. If the proposed 1984 harvest of 20-40 males takes place, it is estimated that 5,000-10,000 kg (5-10 tonnes) of usable meat will be available for consumption. The mechanism to ensure proper distribution and utilization of such quantities of meat should be in place prior to any harvest.

Resident and non-resident hunting, if initiated, should be restricted to a specific season in designated portions of the Sanctuary. While this hunting quota is low, a lottery system could be used to distribute permits. Collection and reporting of kill information must be mandatory.

Expansion of the herd's range from the Sanctuary is believed to be occurring via the Caen Lake area. To encourage this range expansion, the Caen Lake area should be designated a no hunting zone to protect emigrating animals.

10) The role of fire in the development and perpetuation of sedge-grasslands in bison habitat is complex and not fully understood. Studies on the Farewell, Alaska bison herd have shown an extension in winter distribution and an increase in sedge dominated habitat after a moderate-to-severe burn in 1977 (Campbell and Hinkes 1983).

Currently the "sustained attack zone" of fire suppression, as designated by the Department of Indian Affairs and Northern Development extends from the Yellowknife Highway to approximately 35 km into the Sanctuary. The remainder of the Sanctuary, including Dieppe and Falaise Lakes, is designated an observation area only.

For the present, with a large majority of the world's wood bison population concentrated in three or four core areas within the boundaries of the Sanctuary, fire suppression within the entire Sanctuary should be considered, more for the protection of the animals than the habitat. With further expansion of range and a greater understanding of the role of fire in bison habitat, re-evaluation of the protection status will take place. Small experimental burns, situated in unused bison habitat far outside the Sanctuary, may be necessary to aid in assessing the role of fire in the perpetuation of adequate bison habitat in northern climes.

11) Potential land use conflicts must be identified and dealt with effectively. In the future, agriculture could become more important in the region. Presently, cattle and horses are being raised near Mills Lake, and as a result, the possibility of these animals transmitting diseases to the herd, or portions of it, is great enough that some action must be taken soon to ensure control of land use in potential bison habitat. At the very least, care must be taken to guarantee that all stock that utilize the area are disease-free.

The present status of the Sanctuary does not preclude occupation of the land for the purposes of agriculture, quarrying or other types of noncompatible land development. An application should be made to reserve the lands in the Sanctuary for use exclusively as a game sanctuary. A reservation established under the *Territorial Lands Act* is the most effective method of controlling land use in the Sanctuary.

12) To a large extent the Sanctuary herd has prospered in the past two decades free from disturbance by man. This disturbance-free existence should continue as much as possible in the future. At the outset, community hunts should be organized in a manner that will minimize harassment of the population. Resident and non-resident hunting must be restricted to a short season in a designated small portion of the Sanctuary.

13) In order to increase public awareness and appreciation of the species, information centres utilizing descriptive signs should be set up along some pull-offs on the Yellowknife Highway, between Fort Providence and Rae-Edz[illegible] Caen Lake area should be reserved for non-consumptive use. Territorial wide dissemination of information should also be initiated. In the present day context of environmental awareness, given the high profile of wood bison in North America, non-consumptive "utilization" of the herd should be encouraged within the appropriate constraints.

K. Poole

Conclusion

The introduction of 18 wood bison northeast of Fort Providence in 1963 was the beginning of a success story in the annals of endangered species in general, and wood bison in particular. The herd is the epitome of a healthy, expanding population; disease-free, high calf production and survival, low mortality and an apparently expanding distribution. With good management practices and decisions, the herd can continue to expand, providing seed stock for repopulation of historic range, and should soon provide a new resource base to the lasting benefit of all residents of the Northwest Territories.

Acknowledgements

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Personal Communications

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Appendix A. Bison population surveys of the Mackenzie Bison Sanctuary herd, 1963-1983.

Date		Total (including calves)	No. calves (% of those classified)	Source
15 August	1963	18	4	Novakowski (1963)
January	1964	16	3	Bourque (pers. comm.)
1 March	1965	18	4	Bourque (1965)
August	1967	42		Carbyn (1968)
14 January	1968	41	7(17.1)	Carbyn (1968)
15 January	1969	56	8(14.3)	Kuyt (1969a)
18 November	1969	43	10	Kuyt (1969b)
6 March	1972	111	24(22)	Rippen (1972)
23 February	1973	122	11(?)	Hall (1973)
24 December	1973	171		Boxer (1974)
3 April	1974	152		Jacobson (1974)
12 March	1975	237		Calef (1975)
2 August	1975	299	62(20.7)	Calef (1976)
12 July	1976	259	51(21.3)	Van Camp (1978)
22 March	1977	356	52(15.7)	Van Camp (1978)
11 June	1977	379	80(22.3)	Van Camp (1978)
18 March	1978	410	72(17.6)	Van Camp (1978)
31 March	1979	580	40(19.8)	Stephenson (1980)
11 June	1979	645	110(17.1)	Stephenson (1980)
14 March	1980	645	77(12.9)	Hawley et al. (1980)
27 February	1981	668		Chowns (1983)
3 June	1981	778		Chowns (1983)
29 July	1981	883	122(13.8)	Chowns (1983)
1 March	1982	712		Chowns (1983)
15 June	1982	1002	128(12.8)	Chowns (1982)
25-26 March	1983	980		Graf (pers. comm.)
15 July	1983	951	122(12.8)	Graf (pers. comm.)

Appendix B. Annual budget — Mackenzie Bison Sanctuary Herd.

The following information is a preliminary breakdown of annual budget costs for research and monitoring of the Sanctuary herd. This breakdown is based on the proposed needs over the next two years. Survey and research projects may be added or deleted in the future as the management strategies are attained or reassessed.

Two days of flying time are now necessary to adequately survey the Sanctuary herd. The March 1983 survey utilized 15 hours of flying time. These costs will escalate in the future with increased herd size and distribution.

Winter survey — March — population count, distribution

15 hours Cessna 185 @ $225h	$3375.00	
3 days room and board, 1 person	300.00	
HTA member for 2 days	200.00	
Miscellaneous expenses (film etc.)	225.00	
		$4100.00

Summer survey — July — population count, distribution, calf count

Same breakdown as winter survey		
Total		$4100.00

Ground segregation work — July

Transportation to, from and within study area — Helicopter 10 h @ $500h	$5000.00	
2 weeks field supplies — 2 persons	500.00	
Miscellaneous supplies	500.00	
Total		$6000.00

Habitat studies — May-August

Vehicle rental 10 days @ $30day	$ 300.00	
Transportation to, from and within study area — Helicopter 10 h @ $500h	5000.00	
Material and field supplies	1000.00	
Food and lodging	500.00	
Total		$ 7800.00

Equipment (will only be purchased once)

1 spotting scope with tripod	$ 500.00	
2 binoculars	600.00	
1 SBX-11 radio	2500.00	
1 portable scale	200.00	
1 tent	700.00	
Camp supplies	500.00	
Field supplies	500.00	
Miscellaneous (airphotos, etc.)	2000.00	
Total		$ 7500.00
Grand total		$29,500.00

Appendix C. Meat production in bison.

Assuming a harvest of 200 annually from a herd of 2000 bison. Of these, approximately:

125 are adult males
35 are adult females
40 are young animals of 1 to 2 years

Average weight adult males 750 kg.
Average weight adult females 550 kg.
Average weight young 350 kg.

Live weight:	125 × 750 =	93,750
	35 × 550 =	19,250
	40 × 350 =	14,000
	Total	127,000 kg.

Using a dress out factor of 45%

Usable meat = 57,150 kg.

Over 57,000 kg of meat could conceivably be produced annually from a herd of 2000 animals.

Average dress weight for a caribou is 45 kg.

57,150 ÷ 45 = 1270 caribou.

Therefore, 200 harvested bison are roughly comparable, from a quantity of meat produced point of view, to 1270 caribou.